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## UNIVERSITY OF RHODE ISLAND

DIVISION OF RESEARCH AND ECONOMIC DEVELOPMENT

# Momentum Research & Innovation

5130

SPRING 2022

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# THE UNIVERSITY OF RHODE ISLAND

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ACKNOWLE

Layout & Design: DesignRoom.co

Photography: Beau Jones

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*Momentum: Research & Innovation* is published by the vice president for Research and Economic Development with editorial, graphic design, and production by the Office of University Research External Relations.

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# FROM THE VICE PRESIDENT

This issue of *Momentum: Research & Innovation* contains several thoughtful, encouraging, and poignant articles to highlight current research at URI, including a short piece on the work of Assistant Professor Jaime Ross, an integral member of URI's *Plastics: Land to Sea* COLAB (see Spring 2021 issue), who is finding new preliminary evidence that microplastics we may be exposed to are being sequestered in brain tissue (at least in experimental models) and may lead to increased risk for neurological diseases. This work underscores both the threat of environmental plastics contamination on human and animal health and why URI chose this topic



for its first University-wide signature research initiative.

In this issue, we are also proud to showcase the deep, rich history, and current role of URI's East Farm campus as a major research asset of the University. East Farm is much more than merely a real estate and research/ teaching resource for us; rather, this parcel of 85 acres has been cared for by the University for 94 years as part of our public trust and with the full knowledge that it occupies the traditional stomping ground of the Narragansett Nation and the Niantic People. As the University's new Land Acknowledgement Statement rightly states: "We honor and respect the enduring and continuing relationship between the indigenous people and this land by teaching and learning more about their history and present-day communities, and by becoming stewards of the land we now, too, inhabit." It is that last line that speaks volumes about how seriously we take our responsibility to protect East Farm and all the land that the University now occupies for future generations.

As you enjoy the article and map showing the history of East Farm, please consider coming to visit and take a walk this fall to enjoy the autumn foliage of the farm during apple-picking season. It is really a stunning gem within South County.

For the past few decades, I have enjoyed very deep research and friendship ties to Australia, and about eight years ago, while traveling in the Kakadu National Park in the Northern Territory, I came across a book of prose authored by an elder in the local aboriginal community (*Gagadju Man: Bill Neidjie.* J.B. Books: Marleston, South Australia, 2005. pp. 30-45). I re-read this book every few years, and his sage words speak volumes about how important it is for us to protect invaluable assets like East Farm as part of our public trust. I will leave you with his wisdom on the following page.

Oh 5. Jh

Peter J. Snyder, Ph.D. Vice President for Research and Economic Development Professor of Biomedical and Pharmaceutical Sciences Professor of Art and Art History University of Rhode Island





People. They can't listen for us. They just listen for money. Money.

We want goose, we want fish. Other men want money. Him can make million dollars, But only last one year. Next year him want another million. Forever and ever him make million dollars. Him die.

Million no good for us. We need this earth to live because We'll be dead, We'll become earth.

This ground and this earth, Like brother and mother.

#### Earth.

Like your father or brother or mother, Because you were born from earth. When you are dead, You'll come back to earth. Maybe little while yet... Then you'll come back to earth. That's your bone, your blood. It's in this earth, Same as for tree.

#### Tree.

He watching you. You look at tree, He listen to you. He got no finger, He can't speak.

But that leaf, He pumping, growing, Growing in the night.

While you are sleeping You dream something. Tree and grass same thing. They grow with your body, With your feeling.

If you feel sore, Headache, sore body, that mean somebody killing tree or grass.

I'm hanging onto this ground. I'll become earth again. I belong to this earth. And earth should stay with us. Tree the same as me. When he get old he'll die. He'll be dead and burn. He'll leave his ashes behind. Tree become earth. I'll become earth. And earth become us.



# RHODE ISLAND COASTAL HAZARDS, ANALYSIS, MODELING & PREDICTION (RI-CHAMP)

written by CLEA HARRELSON '20

Fox Point Hurricane Barrier, Providence, RI





Emergency managers in Rhode Island and other coastal areas face mounting and interrelated environmental hazards such as flooding, hurricanes, storm surges, and sea level rise. To help decision-makers understand risks from these hazards and prevent or mitigate potential impacts, an interdisciplinary team of researchers from the University of Rhode Island (URI) and the Coastal Resources Center (CRC), in partnership with emergency managers across the state, has developed a new modeling tool to support strategic planning and response: Rhode Island Coastal Hazards, Analysis, Modeling & Prediction (RI-CHAMP).

"We're all concerned about climate change and the impact of extreme weather, and now we're developing the advanced tools needed to understand future impacts," says URI Graduate School of Oceanography (GSO) Professor Isaac Ginis.

He co-leads the RI-CHAMP team alongside URI Associate Professor Austin Becker, marine affairs, and CRC Pam Rubinoff, associate coastal manager and coastal resilience and extension specialist.

The central product of RI-CHAMP is a digital dashboard that allows emergency managers to overlay hurricane and nor'easter prediction models

RI-CHAMP is a digital dashboard that allows emergency managers to overlay hurricane and nor'easter prediction models onto data points across Rhode Island that mark critical infrastructure assets such as generators, transformers, roads, and pump facilities.



onto data points across Rhode Island that mark critical infrastructure assets such as generators, transformers, roads, and pump facilities. Threehundred and sixty data points have been created to date by surveying Rhode Island emergency and facility managers.

By collecting information about equipment or site features that are key to the operation of a facility in one central tool, managers and researchers can better understand the potential cascading impacts of storms, such as the inability to access a transformer due to flooding.

The novelty of this project has earned the RI-CHAMP team \$2.6 million from the Department of Homeland Security (DHS) Science and Technology Directorate's Coastal Resilience Center of Excellence program since 2016. In addition, RI-CHAMP has received multiple awards from the National Park Service, the National Oceanic and Atmospheric Administration (NOAA), the U.S. Department of Defense Office of Local Defense Community Cooperation, and Rhode Island Sea Grant, for related projects since its inception.

Becker describes the cutting-edge combination of storm and local infrastructure data as only the beginning for both risk analysis (using past storms or simulated storm models) and real-time prediction of impacts from active storms.

"This basic setup is customizable, so it could really be used with any facility complex, or piece of infrastructure," Becker says.

Clara Decerbo '18, director of the Providence Emergency Management Agency (PEMA) and one of the managers involved in RI-CHAMP, is already putting components of the tool to work at PEMA.

"We do trainings and exercises for the Providence mayor and his senior staff every year, and in 2021 we were able to plug different variables into the RI-CHAMP dashboard and use those outputs for exercise scenario modeling," Decerbo says. "Having a visual of what a potential storm's impact can look like in our city is really helpful."

One way RI-CHAMP models have impacted decisionmaking in Providence is through analysis of the Fox Point Hurricane Barrier, built across the Providence River in the 1960s to protect the downtown area against storm surges.

"The hurricane barrier has never been tested in big

storms, so we were able to do a simulation of what would happen if the barrier was closed and if the barrier was open," Ginis says.

In one scenario called "Hurricane Ram," Ginis and his team created a hypothetical storm that stalls over Providence for one day, resulting in heavy, sustained rainfall. The modeling produced for "Hurricane Ram" highlight areas of vulnerability and are an important tool for emergency managers and planners working to mitigate flooding risk in highrisk communities and proactively prepare for future storm events.

Given that many major coastal cities in the U.S., such as Boston or New York, face compounding challenges of extreme weather events and climate change impacts such as sea-level-rise, both Becker and Ginis highlight that RI-CHAMP serves a model for emergency managers and researchers in other areas.

"It is absolutely a scalable concept," says Becker. "So long as there are storm models that can be run at a high enough resolution to be useful at the local scale, there's no reason this can't be done in other areas to help emergency managers and planners understand potential consequences."

Becker and Ginis emphasize that the resolution of data, for both storms and facilities, is what makes this project stand out.

High-resolution oceanic and atmospheric data and modeling provide critical detail and accuracy for





the wind, wave, and storm surge variables that make up RI-CHAMP's hurricane and nor'easter scenarios. Ginis argues that high-resolution data and modeling allow managers to be proactive in planning for impacts on specific assets, like generators, in a way that is "unprecedented."

"We are very site-specific to accurately simulate whether a facility may fail under certain conditions,

such as storm surge flooding," Ginis explains. "We are actually able to put the elevation of a generator at a specific facility into our computer model."

RI-CHAMP team members worked with infrastructure facility managers to create baseline thresholds for a facility. Common vulnerabilities considered include access to a site (in the event that roads are flooded), function of key equipment such as generators, and



King Tide event, November 7, 2021 in downtown Providence, RI

impacts to potential evacuation routes. Facility data was primarily collected by student researchers through site visits and conversations with managers across the state.

"Typically, the weather prediction models from the National Weather Service have spatial resolution on the order of 10 kilometers, and the best hurricane models on the order of 1 kilometer," he adds. "We're working in RI-CHAMP at a much higher resolution of 10 meters." RI-CHAMP's innovative modeling is informed by Ginis' distinguished, 28-year career in this field, which includes the development of forecasting models actively used by the NOAA National Hurricane Center and Joint Typhoon Warning Center. After working on the fundamental science of extreme weather models, Ginis says he prioritizes research that people will use—this is what drew him to the RI-CHAMP project.

"That's why this tool is so powerful," explains Becker, "Instead of applying Ginis' models to generic maps, we're letting managers tell us what's important to them at a local level and helping them figure out how to adjust based on different scenarios."

According to Becker and his team, building strong relationships with state agencies, facility managers, and emergency managers has been essential in understanding the collaborative effort of predicting extreme weather events. Becker describes the CRC as playing a key role in brokering relationships with managers across Rhode Island.

"Practitioners were brought in from the very beginning," says Becker. "We went to RIEMA with our concept for RI-CHAMP and said, 'Would this be useful to you?"

Decerbo underscores the importance of engagement.

"Frequently these types of tools are built in a silo in academia and then just spit out to the field," says Decerbo. "RI-CHAMP has done a really good job of including people from the practitioner realm, which makes the tool much more user-friendly and valuable."

In addition to frequent communication with emergency managers through data collection, trainings, and meetings with an informal steering committee of practitioners, Becker and Ginis credit teamwork among URI researchers and students for their success.

"I think there's a huge amount of mutual respect for the different pieces that each discipline contributes, including the outreach by CRC," Becker says. "Having an interdisciplinary team has been incredibly important for us."

A full prototype of the dashboard was shared with the RI-CHAMP steering committee for review in January 2022. The RI-CHAMP team hopes to transition management of the dashboard to RIEMA over the next year so that data is in the hands of decision-makers and to ensure that assets can be easily updated as necessary.

The RI-CHAMP team is also in the process of exploring ways to adapt the dashboard for real-time prediction in the 2022 hurricane season, which would allow facility managers with sites in the path of active storms to receive electronic notifications about the potential threat to infrastructure.

## SUPPORTING THE PROFESSIONAL DEVELOPMENT OF STUDENTS IS A CENTRAL GOAL OF THE RI-CHAMP PROJECT. STUDENTS HAVE TAKEN ON LEADERSHIP ROLES AT EVERY STAGE OF THE PROJECT.

"It's been such a great opportunity for students to not only gain research skills and see the challenges of applied research but also to just network and get to know people in this field." - Austin Becker

## DEB CROWLEY PH.D. CANDIDATE GRADUATE SCHOOL OF OCEANOGRAPHY

For Deb Crowley, a second year Ph.D. student in URI's Graduate School of Oceanography (GSO), high-quality data and robust models are the first line of defense against coastal hazards like hurricanes and nor'easters.

"The more we understand about storm conditions and impacts, the better we can plan," Crowley says. "When it comes to storm modeling, you'd always like more data."

She notes that even seemingly simple goals, like validating flooding during and after a storm, can require getting creative, including scouring the internet for photos and videos of impacted areas.





But these challenges are worth the effort, Crowley says that the suite of storm models she has helped develop for the RI-CHAMP project matter not just for those interested in assessing potential damage to buildings and infrastructure, but also to everyone who lives in a coastal area.

"The more we understand about storm conditions and impacts, the better we can plan. When it comes to storm modeling, you'd always like more data." "Even if you're not directly hit, there's a chain reaction of impacts," she says. "Understanding the timing of a storm, how to best prepare—it's all important. Some of the work feeds into evaluating evacuation routes. There are things that you need modeling to evaluate."

Crowley attributes the success of the RI-CHAMP team to good communication and says that being able to work with faculty and students across GSO, the Department of Marine Affairs, and CRC has been an important benefit of participation in this project.

In addition to the RI-CHAMP dashboard project, Crowley is involved in multiple other storm modeling initiatives with URI Professor Isaac Ginis, including a partnership with the National Park Service to study nor'easters and a NOAA project focused on resiliency planning.

One common thread throughout her work is a strong focus on getting data into the hands of decision-makers.

"For me, I really want what I'm doing to be useful for someone, and so it's really meaningful to see these models being put to use for such a great purpose to prepare and protect communities," says Crowley.

- Deb Crowley



## KYLE MCELROY PH.D. CANDIDATE MARINE AFFAIRS

Although the novelty of uniting coastal hazards data and critical infrastructure data through the RI-CHAMP dashboard is exciting, Kyle McElroy can't wait until this tool and the protocols the RI-CHAMP team has developed are standard practice.

"All of the data we've collected and materials we made being used regularly by emergency managers—that's what I'd view as success," McElroy says.

McElroy, a second year Ph.D. student in URI's Marine Affairs Department, joined the RI-CHAMP project just as the team was expanding data collection on critical infrastructure facilities for wastewater and maritime treatment facilities statewide. After quickly getting up to speed, she created a data collection tool using the online digital map, ArcGIS Survey123, and dove into working with facility managers to enter data about vulnerable infrastructure.

"The ultimate goal is to have facility managers be able to use this tool themselves," McElroy explains. "Managers will review and update their data annually, so if a facility or particular asset changes, that would be reflected in the dashboard and models."

In addition to data collection, McElroy also has led efforts to develop training materials and videos to aid the transition of dashboard operations from the RI-CHAMP team to RIEMA and she helps run the steering committee that supports the RI-CHAMP project.

Maintaining close contact with the steering committee and the development of training materials are nearly as important as the tool itself.

"Longevity of the tool is a priority for everyone," she says.

Data collection and close collaboration with emergency managers has also provided unique opportunities to connect with practitioners.

"I am someone who always believes in networks," says McElroy. "I worked with the U.S. Army Corps of Engineers as a coastal engineer before coming to URI. So, working with emergency management and increasing my network and knowledge when it comes to coastal hazards and impacts has been valuable to me. I'm also interested in longterm coastal resiliency planning and seeing this side of response is huge."

"THE ULTIMATE GOAL IS TO HAVE FACILITY MANAGERS BE ABLE TO USE THIS TOOL THEMSELVES."

- Kyle McElroy



## SAM ADAMS PH.D. CANDIDATE, MARINE AFFAIRS DIRECTOR, URI EMERGENCY MANAGEMENT AND ASSISTANT DIRECTOR, PUBLIC SAFETY

"The traditional processes and indicators used to assess damage from coastal hazards like storms are a little strange to me," says Sam Adams. "It's all focused on the economic cost of replacing buildings or the percentage of infrastructure destroyed rather than the actual impact to the community."

He says he hopes to shift this perspective to include the more nuanced and often cascading impacts of hurricanes and nor'easters through his role as URI's emergency management director and assistant director of Public Safety and through his doctoral studies in marine affairs as part of the RI-CHAMP team. For his dissertation, Adams will focus on how tools like the RI-CHAMP dashboard are implemented by emergency management agencies.

Adams's interest in the vulnerability of coastal communities is also personal.

"I grew up in New Orleans and was affected by Katrina," he says. "That's what got me interested in emergency management in the first place."

His personal ties to coastal communities and professional experiences working as an emergency manager for the past 15 years are what motivate him to focus on building a system that's useful. "I've been a translator for our team," explains Adams, of his multi-faceted role in RI-CHAMP. "I help define what's useful for an emergency manager and lead trainings about how to use the dashboard."

Adams says he is excited to use his dual role as a student and an emergency manager to think critically about how hazards are identified and the impact of climate changes on hazard response for URI. Working with a consultant and other internal URI partners, Adams's emergency management team is in the process of developing a new hazard mitigation plan for the University.

"We are going to collect data on critical infrastructure on the Narragansett Bay Campus, which we're then going to model in RI-CHAMP," he says. "This will be the first time we have the opportunity to use the outputs from RI-CHAMP and incorporate them into an actual hazard mitigation plan. It's very exciting."

Adams stresses the importance of effective implementation of RI-CHAMP through these projects to both provide immediate benefits and advance broader conversations in his field.

"I've reached the point in my career where I want to be more than just a good emergency manager," Adams says. "I want to contribute to the foundation of my profession. This is how I can start to make change."

> Adams says he is also excited to use his dual role as a student and an emergency manager to think critically about how hazards are identified and the impact of climate changes on hazard response for URI.

When a whole constituency is absent from our economic assessment, the result is ineffective policy.

# STRUCE TO MAKE THE INVISIBLE VISIBLE

written by ARIA MIA LOBERTI '20

Equal pay for women remains a hot-button issue in both American and global politics. However, analyzing women's contributions to and compensation within the workforce and economy gives us a glimpse of only half the story.

Many well-accepted economic models are based on gendered assumptions such as the stereotype that women take care of the home and children while men are the so-called breadwinners, or that families follow a nuclear or heteronormative model.

At the University of Rhode Island (URI), economics Associate Professor Smita Ramnarain uses gender as a lens in her research to understand what economic theories might miss in their assumptions and formulations, and the impacts of these omissions. Her research falls at the intersection of feminist



political economy and economic development and focuses particularly on gendered aspects of development in South Asia.

Statistics from the World Economic Forum, United Nations, and Oxfam reveal widespread gender discrimination with respect to prosperity and wealth. These studies reveal that women, globally, are doing more work than men that remains uncompensated and unrecognized. A recent report from the New York Times explains that women spend four and a half hours per day on unpaid labor outside of the workforce, while in contrast, men on average spend less than half that time on such work. Men's contributions, therefore, remain more visible in calculation of economic growth, while a large proportion of women's work tends to not be recognized as work despite contributing to economic well-being.

These numbers are substantially higher in the developing world; for instance, in India, women's unpaid labor takes up an estimated six hours per day. Prominent figures like Melinda French Gates have sought to bring this issue to Studies reveal that women, globally, are doing more work than men that remains uncompensated and unrecognized.



public attention. In her recent book, *The Moment of Lift: How Empowering Women Changes the World*, French Gates explains that, on average, women worldwide spend more than double the hours as men on unpaid labor, and that women in the developing world are at a particular disadvantage.

"One of the biggest contributions of feminist economics is its ability to highlight that there are parts of the economy that do not come into markets or any sort of metric," Ramnarain says, "but which are still very essential to social reproduction and human life. That is, these are the activities that reproduce society and the next generations of people."

The unpaid, or reproductive, labor largely assigned to women due to gender norms which includes maintenance and upkeep of the home, caregiving for children and family, cooking, fetching water, collecting fuel and fodder, providing education, and beyond—is vital but remains invisible in both data and policy.

Society tends to value paid work in the labor market more so than equally necessary work carried out in the home or private sphere; women are generally considered responsible for the latter.

"Their work," Ramnarain says of these women, "is actually really essential, and they provide necessary and crucial services toward the reproduction of life and society, but is not reflected in the economic data we collect." These data influence policymakers. When a whole constituency is absent from our economic assessment, the result is ineffective policy, even if well-intentioned, that fails to adequately bridge the gender gap.

Ramnarain also is concerned with women in nontraditional households (such as femaleheaded households), the labor force participation of women, and the distribution of women's reproductive labor in the household. "The idea behind this kind of work is to highlight what is hitherto invisible in economics statistics and therefore in policymaking. I also want to understand how these policies impact women."

One of her many recent projects considered widow-headed households in post-conflict Nepal. Many widows were being offered training for employment, but those skill-development and training programs often taught handicrafts.

"These were not really a sustainable form of income-generation," Ramnarain says.



The unpaid, or reproductive, labor largely assigned to women due to gender norms which includes maintenance and upkeep of the home, caregiving for children and family, cooking, fetching water, collecting fuel and fodder, providing education, and beyond—is vital but remains invisible in both data and policy.



She adds that Nepal changed its constitution to allow women the right to property ownership. However, many widows did not claim their family property because they did not want to alienate their marital kin. The projects of recovery and rebuilding also tended to neglect women's significant contributions and unpaid work in terms of providing for and maintaining their families and communities. Her study concludes that failure to examine women's lives in a cohesive and economically illustrative manner will contribute to their continued marginalization in economic discussions.

Ramnarain received her Ph.D. in economics from University of Massachusetts, Amherst, and recently authored a chapter in a collected volume (The Handbook of Gender in South Asia, Edward Elgar, 2020), exploring the continuum of gendered violence during mass conflict and in the transitional period after. In this work she strives to understand violence against women in a post-conflict society as inclusive of not only interpersonal or domestic violence but also of property-based violence and dispossession, violence and exploitation at work, and human right violations, and structural violence. She argues that the neglect and depoliticization of violence against women in societies transitioning out of violent conflict ignores the deep connections between everyday forms of gendered violence, and large-scale structural violence.

Ramnarain's passionate spirit and unstinting support of her students are reflected in her work. She has mentored multiple students through the College of Arts and Sciences Summer Fellows Program since its inception in 2018.

"Because I can work with students, my research agenda is also benefitted," says Ramnarain. "There

are so many opportunities in this department and in the college that help me support undergraduate research, which I think is an important experience for students. Being able to build upon the synergies between research and teaching is very important to me."

She also co-produced and co-led the fall 2018 Honors Colloquium, an annual flagship program at URI, the topic of which was Gender: Voices, Power, Activism. She and the other members of the colloquium core committee brought prominent feminist scholars from various institutions and backgrounds to URI to offer a public lecture series in conjunction with a special course for Honors-eligible students.

Ramnarain says the experience was invaluable in that it allowed her to connect with students of all levels who have budding passions for these topics.

"I wanted to be in a public university," Ramnarain says of her initial path to URI, "because there is an emphasis on all the right things in terms of students' access to their education."

She attributes URI's emphasis on cross-disciplinary collaboration, its motivated students, and its broad set of resources to giving her countless tools for shedding light on crucial social issues that often go unaddressed or under-represented.

"The production of any form of knowledge tends to be a political process," Ramnarain asserts. "It is incumbent on scholars to be aware of our roles and responsibilities in this exercise to the extent that we can. We do this work because there is a desire to better understand our world and the human condition."

# PROMOTING A SUSTAINABLE AND INCLUSIVE CULTURE

of undergraduate research excellence at the University of Rhode Island

written by ALLISON FARRELLY '16



The University of Rhode Island (URI) is the recipient of a National Institutes of Health (NIH) training grant to encourage underrepresented students to pursue Ph.D. and M.D./Ph.D. programs postgraduation. MARC U\*STAR, short for Maximizing Access to Research Careers – Undergraduate Student Training for Academic Research, is one of a series of funded efforts by the NIH to increase workforce diversity in biomedical fields by supporting students from underrepresented backgrounds.

The NIH definition of eligibility for this grant includes students who are racial or ethnic minorities, federal Pell Grant eligible, disabled, or firstgeneration college students, among other factors. Niall Howlett, a professor in the College of the Environment and Life Sciences, hopes to make more URI students aware of their potential eligibility for these funds.

Howlett and colleagues URI biological sciences Associate Professor Bryan Dewsbury and URI community equity diversity Associate Vice President Michelle Fontes identified two key goals for URI's MARC program: Create an environment where students can learn the skills they need to become confident scientists and to create a community of scholars who feel a sense of belonging in the field of biomedical sciences.

Senior pharmaceutical sciences major Nana Oblie says the support MARC offered her has extended beyond academics.

"The most important thing about MARC that I love is the community," Oblie says. "Once you join, you become part of the family. We share our struggles, our success stories, our time, our smiles, and our inspirational stories. We do this so we



MARC U\*STAR staff and students from left to right are Professor Niall Howlett, undergraduate student Anya Sondhi, Graduate Assistant Coordinator Jacob Green, Program Coordinator Meagan Pepper Estes, and undergraduate student Nana Oblie.

know we are not alone, and it makes it so much easier knowing you have cheerleaders who are willing to help anytime."

Howlett hopes that MARC can help students navigate complex barriers in applying to graduate school programs. The barriers a student from an underrepresented background may face in matriculating to graduate school range from financial insecurity, a lack of family support, or the absence of a sense of belonging in the greater scientific community.

Anya Sondhi, a senior molecular neuroscience, and biology double major, says MARC not only gave her financial support, research experience, and a community of scientists at URI, but also the guidance she needed to successfully pursue a Ph.D. program.



"The Ph.D. application process is not really talked about in college," Sondhi says. "Everyone knows exactly how you apply to college, but in college when you are applying to a Ph.D. program you don't necessarily have the same support. It can be confusing where to start, and a lot of times underrepresented students do not have people in our families who gave gone through the process that we can turn to. It is really helpful to have advisors who can walk you through it." "We share our struggles, our success stories, our time, our smiles, and our inspirational stories. We do this so we know we are not alone, and it makes it so much easier knowing you have cheerleaders who are willing to help anytime."

## - Nana Oblie

MARC students are actively supported by Program Coordinator Meagan Pepper Estes and Graduate Assistant Coordinator Jacob Green, who meet with the trainees bi-weekly to offer professional development, academic assistance, and holistic support.

Howlett says, "The NIH has realized over the last 10 to 20 years that in order for us to do better research, we need to have more diverse teams of scientists with different experiences and different creativity—great minds think differently. We've also got to think more about the well-being of the individual doing the research as well as the communities impacted by the research."

MARC is currently open to juniors at URI. While in the two-year program, trainees are provided a yearly \$10,000 tuition scholarship, a monthly

# **"IT MAKES A HUGE DIFFERENCE IN THE TRAJECTORY OF THESE STUDENTS, THE MARC PROGRAM IS PROMOTING A SUSTAINABLE AND INCLUSIVE CULTURE OF UNDERGRADUATE RESEARCH EXCELLENCE AT THE UNIVERSITY OF RHODE ISLAND."**

- NIALL HOWLETT





MARC not only gave Anya Sondhi financial support, research experience, and a community of scientists at URI, but also the guidance she needed to successfully pursue a Ph.D. program.

\$1,200 stipend, in-state tuition matching for out-of-state students, a budget for a summer research experience at an external research-intensive institute, funds to travel to an annual scientific conference which is typically the Annual Biomedical Research Conference for Minoritized Students meeting, and a designated research faculty mentor.

Beginning in 2019, the NIH awarded URI five years of funding for four trainees per year – a number Howlett hopes to increase. The MARC team also aims to expand MARC participation to STEM disciplines across the University.

"It makes a huge difference in the trajectory of these students," Howlett says. "More importantly, by helping to create a community of student scholars with a strong sense of belonging in biomedical research, the MARC program is promoting a sustainable and inclusive culture of undergraduate research excellence at the University of Rhode Island."



"Students love how much hands-on training East Farm provides them."

- Brian Maynard

# EAST FARM 94 YEARS AND STILL GROWING

T.J MCGREEVY, BRIAN GERBER, **THOMAS HUSBAND & AMY GOTTFRIED MAYER** FISHER & BOBCAT RESEARCH 2015 - CURRENT

TICK RESEARCH PLOTS **THOMAS MATHER & JANNELLE COURET** 2012 - CURRENT



HONEYBEES\* CURRENT

**EVAN PREISSER & RICHARD CASAGRANDE** RESEARCH ON HEMLOCK ADELGID & **PREDATOR-PREY INTERACTIONS** 2005 - CURRENT

EAST

OAK FOREST

SCOTT MCWILLIAMS **USED CRABAPPLES TO** STUDY NUTRITION IN **MIGRATING BIRDS** CURRENT LARRY ENGLANDER EVALUATION OF **CRABAPPLES FOR** DISEASE RESISTANCE 1980-1990 POLLINATION STUDIES HONEYBEES 2014 - CURRENT

> **ROBERT HINDLE** PLANT **IDENTIFICATION**

CUTTINGS FROM CA.

JOHN MCGUIRE **EVALUATED PLANT** MATERIAL FOR THE NURSERY INDUSTRY 1970-1990

ARBORETUM

**5 ACRE FIELD** 

POLLINATOR PLANTINGS 2014 - CURRENT

CHERRY TREES

1960s

HONEYBEES\* 2014 - CURRENT

**WETLANDS** 

\*HONEYBEES **MATTHEW KIESEWETTER** & STEVEN ALM 2014 - CURRENT

HONEYBEE, NATIVE BEE & POLLINATOR PLANT RESEARCH 2014 - CURRENT

"We have some really good legacy activities going on there and how do we build on it and how do we do the next set of things that make it an even more important part of the portfolio?"

- Dean John Kirby

We would like to thank Professor Steven Alm, faculty emeriti Wayne Durfee, and URI graduates and former East Farm employees Bill Johnson and Chuck Dawson for their assistance in compiling this history of research at East Farm.

\* Aerial photo courtesy of the URI Environmental Data Center Laboratory https://www.rigis.org.

FLOODPLAIN WETLANDS

FRUIT TREES 1940 - 1960 VLADIMIR SHUTAK, ROBERT GOUGH & STEVEN ALM APPLE RESEARCH 1980s - CURRENT

BLACKBERRIES, PEACHES & PEARS CURRENT WILLIAM KRUL GRAPE RESEARCH 1985-1990

BRIAN MAYNARD PLANT EVALUATION FOR THE NURSERY INDUSTRY 1992 - CURRENT

EVERETT P. CHRISTOPHER, VLADIMIR SHUTAK, ROBERT GOUGH & STEVEN ALM BLUEBERRY RESEARCH 1950s - CURRENT

> HONEYBEES\* 2014 - CURRENT



CHICKEN COOPS ACTIVE 1930 - 1970

HONEYBEES\*

WAYNE DURFEE RESEARCH ON RHODE ISLAND RED CHICKENS 1940s - 1970s

MARK STOLT RI SOILS RESEARCH CURRENT

JON BOOTHROYD GEOLOGY RESEARCH 1975 - 2010

# APPLE ORCHARDS

SUNFLOWERS & POLLINATOR

PLANTINGS

CURRENT

CURRENT

KATHLEEN CASTRO,

BARBARA SOMERS,

**MITCH HATZIPETRO** 

LOBSTER & FISHERIES

LAURA SCROBE,

RESEARCH

1989 - CURRENT

RS OR MASTER GARDENER BUMBLE BEE PLANTING. RHODODENDRON STOCK PLANTS CURRENT

PLANT SCIENCES CENTER CLASSROOMS & LABORATORY MOSQUITO ABATEMENT CENTER CURRENT

SOIL TESTING 1980s ENTOMOLOGY CURRENT MASTER GARDENER GREEN HOUSES 1995 - CURRENT

> COMMERCIAL FISHERIES RESEARCH 2004 - CURRENT

> > PETER PATTON, SCOTT MCWILLIAMS, THOMAS HUSBAND, ORNITHOLOGY, MAMMALOGY 1977 - CURRENT

TERRANCE BRADLEY AQUACULTURE 1986 - CURRENT, JACQULINE WEBB SENSORY SYSTEMS OF FISHES 2021 - CURRENT, DAVID GREGG RI NATURAL HISTORY SURVEY, NUMI MITCHELL COYOTE RESEARCH

2015 - CURRENT

RICHARD E. WOLKE FISHERIES 1984 - 2006 MARTA GOMEZ-CHIARRI AQUATIC PATHOLOGY 1997 - CURRENT, JANNELLE COURET MOSQUITO & TICK RESEARCH 2014 - CURRENT



# EAST FARM C. 1965

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Photo courtesy of URI Archives and Distinctive Collections.

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A HISTORY OF URI'S EAST FARM

## written by CHRIS BARRETT '08

Professor Steven Alm stands in the middle of his laboratory. Surrounded by roughly 85 acres of meadows, forests, orchards, greenhouses, and fish tanks, Alm, a professor of plant sciences and entomology, calls his surroundings a hidden gem.

For 94 years, the University of Rhode Island (URI) East Farm has operated as a living laboratory for generations of URI students and faculty researchers. A mile from the bustle of the Kingston campus, researchers dig, grow, prune, harvest, and observe to think big about solving

species decline, bolstering the horticulture industry and studying fish.

"We can conduct field experiments here, things you can't do in a 20-by-20-foot lab," says Alm.

Sprouting Golden Delicious, McIntosh and Rhode Island Greening apple trees, the orchards at East Farm afford researchers opportunities to assess new cultivars, and teach pest control, pruning and growing techniques. URI plant sciences and entomology Professor Larry

For 94 years, East Farm has operated as a living laboratory for generations of URI students and faculty researchers.

At the center of the poultry research stood Wayne Durfee, '50 and '53. He was a Navy veteran who attended URI as a student and went on to serve on the faculty for 38 years teaching students in the methods of poultry raising and processing.

WAYNE DURFEE '50 AND '53 Faculty Emeriti



Touring East Farm from left to right are Ph.D. student Casey Johnson, South County Museum Assistant Director Christopher Cunningham, Professor Steve Alm, Faculty Emeriti Wayne Durfee, and Mary Parlange.







Englander used the crabapples in the Lester P. Nichols Crabapple Arboretum to evaluate scab resistant trees for the nursery industry. Brian Maynard, also a URI professor of plant sciences and entomology, supports the nursery industry by evaluating plants that eventually make their way to the URI Kingston campus. And natural resources science Professor Scott McWilliams has used the crabapples to study bird nutrition. Other flowering plants on the farm are meant for the bees. Blueberry bushes and pollinator meadows offer opportunities to study pollination biology. Students monitor the fields of pollinator habitat to identify plants preferred by bumble bees to pinpoint ways to conserve declining populations of native bees. Honey bee hives are maintained to study novel methods for controlling pests of honey bees.

What is now the University of Rhode Island began as the state's agricultural research station.

"Here you can look at the plant, you can smell the plant and you can taste the plant."

- Brian Maynard

In the fisheries buildings, Professor Terence Bradley and his research team from URI's Department of Fisheries, Animal, and Veterinary Science, Barbara Somers, Laura Skrobe, Mitch Hatzipetro, and Captain Steve Barber offer students and industry professionals aquaculture training and support the fishing industry. Biological sciences Professor Jacqueline Webb studies sensory systems of fishes.

Elsewhere on East Farm, entomology Professor Thomas Mather and biological sciences Assistant Professor Jannelle Couret place ticks in chemically treated plots of leaf litter to learn how to best prevent ticks and tickborne diseases. Natural resources science Professor Mark Stolt digs soil pits to train students and professionals in soil morphology. Biological sciences Professor Evan Preisser conducts ecological experiments on predator-prey interactions and researcher Lisa Tewksbury of the URI Biocontrol Lab uses insects for the biological control of invasive plants and pests.

"Here you can look at the plant, you can smell the plant and you can taste the plant," says Maynard. "Students love how much hands-on training East Farm provides them." For Alm and others, the farm represents the institution's roots, literally and figuratively. What is now the University of Rhode Island began as the state's agricultural research station. By 1928, researchers helping the fruit industry needed a place to plant fruit trees away from the campus of the then named Rhode Island State College. Twenty acres of nearby farmland proved opportune. James Lewis Gough sold the land to the state in what marked the college's first expansion beyond Kingston Hill. His grandson, Robert Gough '73, graduated from the college and became a horticulture professor, spending many hours at East Farm.

After the purchase, laborers planted fruit trees, mostly apple trees, and researchers followed. In 1940, a 45-acre purchase more than tripled the farm's size. After World War II, a sharp rise in enrollment driven largely by returning veterans utilizing the GI Bill —led to an expansion of the institution, including East Farm with a roughly 20-acre purchase in 1951 to grow the farm to its present-day size.

Fruit research, especially apple varieties, became big business with apple orchards extending to Route 108. The Rhode Island Apple Growers Association



routinely met on the farm, held public events, and asked college researchers to explore growing techniques and pest management. A cider mill processed the apples, shipping the cider to market while extra apples went to campus dining halls.



The apple research proved to be ahead of its time. The public had not yet embraced novel apple varieties and shunned them in favor of common varieties, says Heather Faubert '81 and '12, a URI research associate who has studied the history of the apple research at the farm.

Alongside the apple research were chickens. Lots and lots of chickens. An influential poultry industry kept researchers busy finding better ways to rear the chickens, while keeping them healthy and improving egg production.

At the center of the poultry research stood Wayne Durfee, '50 and '53. He was a Navy veteran who attended URI as a student and went on to serve on the faculty for 38 years teaching students in the methods of poultry raising and processing.

"It was an exciting time," Durfee says.

As a student, Durfee was charged by administrators with keeping an eye on the place. From his perch in a three-room house on the property, he monitored the hens living on the farm for an annual egg laying contest. Started in the 1930s, the annual contest brought flocks of hens from upwards of 50 farms throughout the country. A dutiful attendant checked the hens five times daily for eggs and recorded egg weight and size.

The contest and the farm enthralled Durfee enough that after graduation he joined the faculty as a poultry professor and got to work designing new facilities to raise and study poultry. A Quonset Hut served as a



Photo by Casey Johnson

makeshift classroom with as many as 40 students at a time cramming in to attend Durfee's animal science class. A Durfee-designed poultry processing plant made a few freshmen squirm, though most students, he says, came from rural Rhode Island where poultry processing was common. The turkeys processed went to the Kingston Campus for sale to faculty and staff for Thanksgiving dinner.

In time, the state's economy changed, emphasis on poultry industry receded, and the Department of Poultry Science merged with what is now the Department of Fisheries, Animal, and Veterinary Sciences. Durfee switched to aquaculture and in the 1980s the University opened a new fisheries building at East Farm to replace the cramped quarters 20 minutes north in Wickford, RI. The half-million dollar, 6,000-square-foot facility was considered innovative for its time. The URI Foundation agreed to provide \$400,000 for its construction under a lease-purchase agreement.

The project proved to be the last major investment in the farm for several decades. Eventually, the poultry buildings were razed or repurposed. Visitors who climb the stairs to the woodshop can find a sign





URI Ph.D. student Casey Johnson

An influential poultry industry kept researchers busy finding better ways to rear the chickens, while keeping them healthy and improving egg production.



Steven Alm stands in the middle of his laboratory. Surrounded by roughly 85 acres of meadows, forests, orchards, greenhouses and fish tanks, Alm, a professor of plant sciences and entomology, calls his surroundings a hidden gem.

reminding staff not to store feed in front of the exit door and can root through the thicket of foliage to find the foundations of two longsince demolished poultry rearing pens.

In the 1990s, most activity at the farm revolved around fisheries research and otherwise the place remained largely quiet. Administrators briefly explored constructing residence halls on the site, but plans never seriously took off, says Robert Carothers, the University's president at the time.

One group did take up residence. During the '90s, the Master Gardener program moved in. The program that trains people in environmentally-sound gardening practices attracted people to the farm, including Carothers, an inspiring green thumb who volunteered to plow the fields driving a John Deere tractor. But, the president emeritus says he was relieved of his duties when someone noted his furrows were not straight.



Left to right, Master Gardeners Rich Horvath and Kenton Dolinich, Professors Steve Alm and Wayne Durfee and writer Chris Barrett discuss East Farm.

In the late '90s, local newspaper publisher Rudolph "Rudi" Hempe joined the Master Gardeners. Inspired by the farm's beauty and research potential, he helped arrange the first of several open houses that drew hundreds of people to the farm for plant sales and horticulture demonstrations.

"I said, 'You know this is the best kept secret in South County," Hempe notes of the inspiration to organize the open houses.

"Pictures can be very helpful but often you need to see a plant sample, which you can often grab from the farm."

- Heather Faubert







Rudi Hempe, University affiliate

"You know this is the best kept secret in South County." - Rudi Hempe Today, Hempe and the Master Gardeners volunteer to maintain much of the grounds and, through a nonprofit, fund the purchase of equipment like tractors. Other volunteers, including URI athletic teams, pick the farm's apples to provide to the Rhode Island Food Bank.

And in the last few years, the farm, under the purview of the College of the Environment and Life Sciences, has seen something of a mini renaissance. Dean John Kirby largely credits Alm, calling him a "hard-working, smart guy" who serves as a parental figure for the farm.

Recent improvements include renovations to research facilities, including the fish lab and a building housing 4-H staff. A refurbished building houses the Fisheries Center of Rhode Island, an industry group, while the original farmhouse was repurposed to host the Master Gardener program.

The college also has kept up its outreach

The apple research proved to be ahead of its time. The public had not yet embraced novel apple varieties and shunned them in favor of common varieties.

mission, especially to the horticulture community. Faubert started in the 1980s helping apple growers and then in 2005 transitioned to assisting the nursery and landscape industry and public through the Plant Protection Clinic, a CSI type unit for determining what killed a plant. She appreciates the farm for practical reasons.

"Pictures can be very helpful, but often you need to see a plant sample, which you can often grab from the farm," Faubert says.

More could happen at the farm. Kirby says East Farm has room to grow. He's challenged the faculty to pitch innovative uses for the property, even beyond traditional agriculture. For example, bringing engineering, public policy, and environmental researchers together to study alternative energy like solar panels.

"There's a lot of opportunity here if we don't get caught up in the traditional [academic] boundary lines," Kirby says. "We have some really good legacy activities going on there and how do we build on it and how do we do the next set of things that make it an even more important part of the portfolio?"









Other flowering plants on the farm are meant for the bees. Blueberry bushes and pollinator meadows offer opportunities to study pollination biology.





Nearly 100 years of education and outreach, the extraordinary living laboratory of URI's East Farm continues to provide the community of Rhode Island with training and expertise.



Photo courtesy of URI Archives and Distinctive Collections.

The apple research proved to be ahead of its time.



Photo courtesy of URI Archives and Distinctive Collections.



RAM, 24, Rifleman, 6th Rajputana Rifles, Son of Subh Ram and BAHADUR MAGAR, Unknown, Piper, Nepalese Contingent, Son of Ma MUHAMMAD, 19. Sapper, Indian Engineers, Son of Gharib and Man

AWAR MARA BARA LE RAM A NATH, BHA, UNK EA, 32, 5 F MUHAMMA AR RAM, 20, ALU, 29, Sep GA SINGH, UN GIA THAPA, ANNA, 20 Indian Pioneer Corps, Son of Ismail and ndian Engineers, Son of Nand Ram and ogra Regiment, Son of Suba Singh and th Punjab Regiment, Son of Narang a Hyderabad Regiment, Son of Mallu and nal Corps, Son of Gokul; husband , 10th Baluch Regiment, Son of Rehm Indian Army Service Corps, Son of Khe dian Army Service Corps, Son of Shikmi man, 6th Rajputana Billion, Son of Bhul Sth Gurkha Rifl

# MAKING HISTORY MORE ACCESSIBLE Through Art

written by HUGH MARKEY

Page 38 | The University of Rhode Island {MOMENTUM: RESEARCH & INNOVATION}

Siriyan, of Chandeni, Jind, Indi Bahadur Lama, of Baneshor, Nepa of Chandhrun, Mirpur, Kashmi: Hazara, Pakistan Ludhiana, Indi Kangra, Indi Kangra, Indi Karnal, Indi Mirpur, Kashmi Jhelum, Pakista Bikaner, Indi Bilaspur, Indi Karnal, Indi ana, Surung, Nepa Indi Indi nd nd. m ANNU PALAKUNNATHU MATTHEW Professor Photography

Annu Palakunnathu Matthew discovered the story of the 2.5 million Indians who fought in World War II (WWII) while researching the Partition of British India.

"It's a complicated history," says the University of Rhode Island photography professor. "As a result, these soldiers are not recognized in South Asia or globally."

Matthew notes, that even as the war raged, India was fighting for independence from the British Empire. By siding with the Allied powers, the Indian soldiers were seen by some as supporting British colonialism.

For Matthew, her artwork asks if these soldiers' personal contributions can be acknowledged. And that sense of injustice drives much of her art.

"Few wanted to recognize the efforts of these Indian soldiers, but on the other hand, what would have happened if they hadn't fought?" Matthew asks. "They were critical to the Allies success of WWII. Through my work, I'm asking whether they can be remembered, both in South Asia and globally, without negating the other historical players."

Her research led to a commission from the Kochi-Muziris Biennale, the largest art exhibition in Asia. The installation and other works with the same theme were recently on display in Rhode Island's Newport Art Museum.

Matthew says that the visual arts can play a role in changing perspectives and expanding one's knowledge of history.



"For this commission, I projected edited archival footage of the Indian soldiers who fought in the Italian Campaign onto the Indian gravestones and memorials in Italy's Cassino and Forlì War Cemeteries at dawn and dusk," Matthew explains. "I then edited these recordings to create a haunting video installation."

Growing up in England, India, and the United States gave Matthew a unique perspective on these cultures.

"My work is shaped by my transcultural experience that contends with alienation and multiple cultural histories," she says. "Because of these dualities of identities, my work is inspired by the experience of belonging and yet not belonging. This experience influenced my approach to teasing out links to voices of other alienated communities and histories in the U.S. and South Asia where colonial histories have long complicated things."

Matthew says that the visual arts can play a role in changing perspectives and expanding one's knowledge of history.

"People will rarely take out a history book and read it," Matthew explains. "I think art can be a way to make history more accessible."

For her Newport show, Matthew created several crystal cubes etched with photographs. On a recent sabbatical and Fulbright Fellowship to India she collected these photos and stories from the South Asian families whose relatives served in WWII. One crystal features a man in the clothes of a military officer. He stares off camera and into the distance. Meanwhile, his wife directs her gaze into the camera and eyes of the viewer. The cubes are lit from below, giving the



"People will rarely take out a history book and read it. I think art can be a way to make history more accessible."

- Annu Palakunnathu Matthew







images a ghostly appearance. Matthew says this display drew the most attention in her Newport show.

"I think there is a mysterious quality to the crystal images," she says, reflecting on the reaction. "The immersive installation also includes audio that allows the viewer to connect with the personal stories and empathize with them."

Matthew sees her work as another way of awakening people to a breadth of global histories that may otherwise be lost.

"We are at a moment where memorials and histories are being re-evaluated and reconsidered in significant ways," she says. "Art can play a crucial role in shaping remembrance. By pulling back the veil on forgotten histories, my objective is to leverage visual media to elevate this narrative and integrate it into our shared historical and cultural legacy." "We are at a moment where memorials and histories are being re-evaluated and reconsidered in significant ways. Art can play a crucial role in shaping remembrance."

- Annu Palakunnathu Matthew

# "I think there is a mysterious quality to the crystal images."

- Annu Palakunnathu Matthew





Jaime Ross never expected to study microplastics. But when the opportunity presented itself to investigate the potential impacts of microplastics on the body, she felt like the timing was right to try something new.

"Researchers have been looking more at the

Ph.D. student Lauren Gaspar

impact of microplastics on marine life and oceans but not the impact on human consumption and disease. We are interested in microplastics because it seemed like a black box in discussions about human health," explains Ross, a University of Rhode Island (URI) assistant professor with joint appointments in the Department of Biomedical and

# WHAT IS THE LIFE CYCLE OF MICROPLASTICS IN THE BODY?

written by CLEA HARRELSON '20



Pharmaceutical Sciences and the George and Anne Ryan Institute for Neuroscience.

Ross' research seeks to rectify this gap in knowledge and answer foundational questions about the life cycle of microplastics in the body and whether chronic exposure to microplastics affects brain health. "WE ARE INTERESTED IN MICROPLASTICS BECAUSE IT SEEMED LIKE A BLACK BOX IN DISCUSSIONS ABOUT HUMAN HEALTH."

- JAIME ROSS



From left to right, Assistant Professor Jaime Ross, Research Assistant Professor Giuseppe Coppotelli, undergraduate student Danielle Burge, undergraduate student Joceline Rodrigues Monteiro, Lab Technician Bethany Healey, undergraduate student Kristen Harder, Ph.D. student Lauren Gaspar, Ph.D. student Sydney Bartman, and Ph.D. student Hannah Tobias-Wallingford.

Her work could be an important pathway to simultaneously advance research on human health and microplastics and leverage the collaborative power of URI's *Plastics: Land to Sea COLAB* (co-laboratories) initiative. Launched in spring of 2021, URI's Plastics COLAB brings together researchers and resources across URI departments and disciplines to understand and address plastics pollution.

Ross' research focuses on the role of genetics, mitochondrial dysfunction, and inflammation in understanding age-related diseases, particularly those that impact the brain such as Alzheimer's.

However, Ross, alongside Research Assistant Professor Giuseppe Coppotelli, biomedical and pharmaceutical sciences, and Ph.D. candidate Lauren Gaspar, decided to investigate potential impacts of microplastics exposure after considering questions about environmental influences on brain health from colleagues in her field.

Through a \$25,000 grant from the Rhode Island Foundation, awarded in March 2021,



Research Assistant Professor Giuseppe Coppotelli



Ph.D. student Sydney Bartman





Lab Technician Bethany Healey (left), and undergraduate student Joceline Rodrigues Monteiro

Jamie Ross' research focuses on the role of genetics, mitochondrial dysfunction, and inflammation in understanding age-related diseases, particularly those that impact the brain such as Alzheimer's. Ross and her team completed a series of small pilot studies to assess patterns of behavior in mice after acute microplastics exposure and to understand how microplastics show up at the cellular level.

"In just three weeks we found very striking changes in behavior in the animals—such as how much they moved, how anxious they were, and how they responded to stimuli like light," Ross says. "That's scary. Then we started to look at the tissues of the mice and found that microplastics had infiltrated every tissue we looked at, including the brain, and were congregated around the nucleus of cells."

She also submitted a proposal to the National Institute of Environmental Health Sciences (NIEHS) Outstanding New Environmental Scientist (ONES) in March 2022 that would allow Ross' team to build off this initial work and answer deeper questions about how microplastics interact with the body and cells.

She explains, "That's the next step. Where do microplastics go when they enter the body?"

Because this research would break new ground, Ross emphasizes that answering basic questions first is critical to building up to the more complicated biological dynamics she hopes her team will explore if awarded funding.

"What we ultimately want to understand is how the environment interacts with genetic background and how that can affect our aging process and potentially make us more susceptible to disease," Ross says.

The project would allow Ross and her team to carry out a series of important phases in research, beginning with what happens to healthy individuals who are chronically exposed to microplastics. This would be followed by assessing the effects



of chronic microplastic exposure in individuals with a predisposition to diseases and potential impacts from microplastics on early developmental life stages.

Ross highlights the importance of exploring what happens after exposure and whether there are potentially biological defense mechanisms, asking the questions: "What happens if you suddenly stop being exposed? Is our body able to expel microplastics or defend against exposure?"

Implementation of this project would rely on a range of URI partners such as Assistant Professor Coleen Suckling, fisheries, animal, and veterinary science, and Visiting Associate Professor Andrew Davies, biological sciences, both contributors to URI's Plastics COLAB. "What happens if you suddenly stop being exposed? Is our body able to expel microplastics or defend against exposure?"

- Jaime Ross

"The body of expertise here is broad and really supportive, and I never would have embarked on this type of research project if I had not been here at URI, with the support of my colleagues affiliated with the COLAB."

- Jaime Ross



From left to right, Assistant Professor Jaime Ross, undergraduate student Danielle Burge, and undergraduate student Kristen Harder.

In addition, Ross says her team would likely work with faculty from institutions such as Harvard University and the Karolinska Institute in Sweden to receive key test tissues and analyze results of experiments. If she receives funding, Ross also plans to hire a postdoctoral researcher to support this work and ensure that students are included throughout the process. Ross describes the support she has from URI faculty and staff leading up to this submission as exceptional.

"The body of expertise here is broad and really supportive, and I never would have embarked on this type of research project if I had not been here at URI, with the support of my colleagues affiliated with the COLAB," Ross says.

# WAVE OF

# THE FUTURE

written by MICHAEL BLANDING

"SUBMARINES HIDE UNDER THE SEA, AND THE ONLY WAY TO FIND THEM IS ACOUSTICALLY."

JAMES MILLE



Historically a dominating force beneath the sea, the United States commands a fleet of submarines and underwater vehicles that have far outstripped the capabilities of other countries. However, others like Russia and China are closing the gap on America's underwater edge by investing huge sums in their naval resources.

"We are seeing tremendous competition from the outside world both for commercial and defense applications in the undersea domain," says Arun Shukla, professor of mechanical, industrial, and systems engineering at the University of Rhode Island. "The gap between us and other countries used to be huge—now it's not as far."

To help maintain its supremacy, the U.S. Navy has turned to a unique partnership with URI, along with the University of Connecticut (UConn) and local industry partners, to develop the next generation of submarines and deep-sea equipment. The National Institute for Undersea Vehicle Technology (NIUVT) facilitates the adoption of the latest research from URI and UConn faculty and students and speeds up the time for the cutting-edge research to be developed into underwater applications. "It creates a massive opportunity for University faculty and students to work directly with national security organizations and defense industrial base partners on real-world challenges in areas of need for technological advancement," says Erik Brine, director of URI's Defense Sector R&D Initiatives and Operations. "For students, it creates great opportunities to work on projects that give them hands-on experience that will give them a leg up on the competition for their careers."

Talks for NIUVT began six years ago among URI, UConn, General Dynamics Electric Boat in Groton, Conn., and the Naval Undersea Warfare Center (NUWC) in Newport, R.I. The joint effort launched in 2019 and expanded to include 16 government and industry partners with government grants of nearly \$40 million so far.

"It's been a game-changer," says Dean Anthony Marchese of URI's College of Engineering. "While we've always had strong partnerships with Electric Boat and NUWC, this center enables us to respond directly to the needs of our partners. At the same time, it provides great opportunities for faculty to develop their research programs in these areas."



Custom fiber optic and ethernet connections are shown installed on a modified low cost unmanned underwater vehicle to allow operation from an unmanned surface vehicle.

To help maintain its supremacy, the U.S. Navy has turned to a unique partnership with URI, along with the University of Connecticut (UConn) and local industry partners, to develop the next generation of submarines and deep-sea equipment.

With three-quarters of the earth's surface covered by oceans, submarines play a vitally important role in protecting the U.S. coastline and supporting military actions overseas. NIUVT fulfills the desire of Congress that the Navy make use of research and technologies developed in academia for both military and commercial purposes.



URI's ocean engineering students are converting a Blue Robotics BlueROV to fiber optic telemetry, allowing for high-bandwidth communication to the surface over long distances.

"NIUVT can help transition new technologies, new ideas, more rapidly into the next platform, the next design," says Richard Christenson, UConn professor of civil and environmental engineering, and co-director of the institute with Shukla. "It's one area where the partnership between industry, academia, and government can be very helpful."

That technology transfer will power the Navy's efforts to replace its aging submarine fleet with new state-of-the-art vehicles and develop new capabilities in unmanned underwater vehicles (UUVs). As one of only a handful of universities nationwide with a department of ocean engineering, URI is uniquely suited to its role in the partnership, providing advanced facilities and equipment—such as underwater test tanks—along with faculty working at the forefront of ocean science. In just three years, NIUVT has developed an impressive 88 applied research projects in a dozen technical areas. The institute includes 88 professors between the two



The Fiber Optic Reel System, (FOReelS), allows for live-stream high bandwidth data transfers from deep-sea environments.

universities, and more than 50 engineers from Electric Boat.

Among the NIUVT research areas is an effort, led by Shukla, which seeks to better understand how vehicles and other objects submerged miles under the ocean respond to underwater shock.

"We expose them to explosive loadings and then look at their structural integrity and other features such as the pressure pulses that reflect back from them," Shukla says.

URI's Dynamic Photo-Mechanics Lab (DPML), which houses Shukla's underwater shock effort, has been working closely with the U.S. Navy over the last four decades and has transitioned more than 40 graduate students to the Navy enterprise. Several employees from NUWC and Electric Boat are currently working on their graduate degrees at DPML.

"It's one area where the partnership between industry, academia, and government can be very helpful." - Richard Christenson Other areas of research include acoustics and sensors, led by URI ocean engineering Professor James Miller (see "Seeing Without Sound" page 56); advanced manufacturing processes, led by URI mechanical, industrial and systems engineering Professor Manbir Sodhi; marine hydrodynamics, led by URI ocean engineering Associate Professor Jason Dahl; and human factors research, led by URI mechanical, industrial and systems engineering Associate Professor Valerie Maier-Speredelozzi (see "The Human Side of Sub Tech" page 57).

The institute also has created a pipeline of experienced students to replace an aging workforce of engineers. Since it launched, NIUVT has employed more than 100 students and postgraduate researchers on projects. Among them, nine doctoral and 25 master's students have already entered jobs in government or industry.

"Students who grow up in this area or gravitate to URI often have an intimate interest in and knowledge of the sea," says Marchese. "They get to work on these projects as part of their degree program, and then they are able to stay in the region and go to work for the Navy or Electric Boat or other local businesses, so it's a win-win."



In addition to those larger businesses and institutions, there are approximately 600 large and small companies that cater to shipbuilding and other naval industries in Connecticut and Rhode Island. That concentration has led to the area being known as the Blue Corridor, or as former Defense Secretary Chuck Hagel called it, the "Silicon Valley of undersea technology." NIUVT is solidifying that reputation by fulfilling vital national security interests and spurring the area's economy.

"We really appreciate the fact that somebody looking from the outside feels that we are better than most people in the country to work at this top level," Shukla says. "It gives our graduate students an opportunity to work on the cutting edge of technology of interest to our country and helps get them jobs." URI is uniquely suited to its role in the partnership, providing advanced facilities and equipment.



Professor Arun Shukla looks at Craig Tilton, engineer, Naval Undersea Vehicle Technology, setting up an experiment inside a large pressure vessel.

# NATHAN TUSTISON, LT. USN

URI Master's Student Ocean Engineering Sonar Module Lead Instructor Submarine Officer Advanced Course Naval Submarine School

# SEEING WITH SOUND

Fans of the movie *The Hunt for Red October* will remember the scene where the Russian submarine captain played by Sean Connery uses sonar to verify the range of an American submarine, while trying not to give away its own location.

"One ping only," the captain famously tells his subordinate as he gets ready to send the signal.

Reality underwater is not too far off from the movies, says URI ocean engineering Professor James Miller. "The ocean is dark and deep and light doesn't go very far, so the only way to see any distance at all is through sound," he says. "Submarines hide under the sea, and the only way to find them is acoustically."

As lead for NIUVT's Acoustics, Sensors, and Signal Processing program, Miller coordinates a range of projects to help the Navy hide its own submarines and find enemy submarines. His work is leading to a better understanding of how sound propagates in different ocean environments based on the sediment of the ocean floor.

"It's like if you are in a hallway without a carpet, where there are a lot of echoes, versus a hallway with carpeting, where it's much quieter," says Miller, who is collaborating with URI ocean engineering Research Professor Gopu Potty. "If you have an Among Miller's students are several active-duty Naval officers who are earning their degrees as part of their shore duty.

ocean floor with soft bottoms, you can't hear the submarines as far as you can where the sediment is much harder."

NIUVT's relationships with the Navy and industry, Miller says, "shorten the time between when we find something out and someone cares about it in the real world."

At the same time, Miller adds, NIUVT provides funding to hire students to go out on ships and perform experiments in acoustic test tanks in the lab. "Instead of just one or two students, I may have six," he says. "It really increases the pace at which we can perform research."

Among Miller's students are several active-duty Naval officers who are earning their degrees as part of their shore duty.

"It's fascinating for me to have the opportunity to learn more about the physical properties of the ocean, especially in complex environments," says Nathan Tustison, a nuclear submarine officer pursuing his master's in ocean engineering with Miller at URI. "It helps me perform personally at a higher level, and also helps me train others that I work with."

Other projects within Miller's program include work by URI ocean engineering Assistant Professor Lora Van Uffelen on acoustic sea gliders that can receive signals over long distances to aid in navigation; and efforts by URI civil and environmental ocean engineering Professor Chris Baxter and URI ocean engineering Assistant Professor Brennan Phillips to develop new high bandwidth fiberoptic sensors to quickly measure ocean and seabed properties.

# THE HUMAN SIDE OF SUB TECH

The most advanced submarine technology in the world doesn't matter if the people operating the subs can't use it.

"You can't have people in intense situations who are not able to use systems efficiently and effectively," says URI's Valerie Maier-Speredelozzi, associate professor of mechanical, industrial and systems engineering. "They have to be able to make the right decision at a moment's notice and hit the right button or locate necessary equipment or tools."

Maier-Speredelozzi has worked for years on human factors research with industrial companies to design better workspaces. NIUVT has provided the opportunity to form new partnerships with the Navy and industry to improve conditions for sailors. "It's been exciting to be able to work more closely with our local naval defense industries," she says. "In military operations, sailors must be comfortable standing watch for long hours, and must be able to see all the different sensors and instrumentation. We want to make things ergonomically comfortable and build in error-proofing."

In one project, a collaboration between industrial engineering and textile design faculty, Maier-Speredelozzi is helping design better personal protective equipment for welding. In another project, she is looking at the effects of fatigue on performance. To do so, she transformed an entire room in URI's Kirk Applied Engineering Laboratory

"It's been really great to be able to contribute to the nation's defense missions and to support all of our people in the military."

- Valerie Maier-Speredelozzi

into a simulation of a submarine control room to create a realistic environment in an unclassified setting. "We can put people into a scenario and look at how individuals and teams perform and interact with systems," she says.

By partnering with URI, Maier-Speredelozzi says, the Navy gains valuable insight into the human side of military technology that they may not have the time or resources to investigate themselves.

"The University can really help to look at problems that go beyond the day-to-day," she says. "We can look at issues with a bit longer time horizon or things that may be on the back burner and provide a new perspective by getting students looking at it."

Maier-Speredelozzi has been connected to the military her entire life through various family members, and that makes the opportunity to collaborate to keep sailors safe and comfortable during their tours at sea even more meaningful.

"It's been really great to be able to contribute to the nation's defense missions and to support all of our people in the military," Maier-Speredelozzi says.

> VALERIE MAIER-SPEREDELOZZI Associate Professor

> > Mechanical, Industrial and Systems Engineering

# THE URI RESEARCH AND SCHOLARSHIP PHOTO CONTEST 2021-2022



# **1ST PLACE:**

### WATER COLLECTION OF A HONEY BEE

# Casey Johnson, graduate student, plant sciences and entomology

"In the heat of summer, honeybees can often be found collecting water from puddles, gutters, and other unsavory sources," says Johnson, who is a graduate student in Professor Steven Alm's lab at the URI Agricultural Experiment Station at East Farm in Kingston, R.I. She continues, "We noticed that our honeybees were drinking water from *sphagnum* moss in the pots of pitcher plants, which led us to investigate the watercollecting behavior of honeybees on four local moss species. Here, a water forager honeybee rests on one of our observational moss setups, drinking water that she will bring back to her hive."

## 2ND PLACE:

## JAM-PACKED MICROMUSSA

# Michael Corso '24, *aquaculture and fisheries science major*

"This *Micromussa lordhowensis* coral colony was shot at Love the Reef, a marine animal distributor/ coral aquaculture facility in Wilmington, Mass., where I work," says Corso, who aspires to preserve tropical marine species. He continues, "In the wild, this species is found in the South Pacific and along Australia's Great Barrier Reef. The bioluminescent colors emanate from the coral's symbiont algae, zooxanthella. Rising ocean temperatures and acidification can prevent the corals from holding onto the algae they depend upon, resulting in coral bleaching. Land-based sustainable aquaculture efforts may be the last chance coral species like these have at surviving in our future environment."



# **3RD PLACE:**

### PIPING PLOVER CHICK

# Branden Costa, graduate student in environmental science and management, focused on conservation biology

Costa observed this juvenile piping plover foraging after a rainstorm on Washburn Island (Mass.). "These birds," says Costa, who studies migratory bird behavior and population dynamics "are vulnerable to many threats before and after hatching, including predation, desiccation, human disturbances, and storm surges. They begin foraging for themselves mere hours after hatching and remain flightless for 25–30 days as they develop flight feathers for end-of-season migration. This chick was the last surviving member of its brood. The others were 'taken' by two off-leash domestic dogs. This chick demonstrates the unwavering resilience piping plovers must exhibit to survive."





# HONORABLE MENTION:

## LAST NERVE

Michelle Gregoire, doctoral student in cell and molecular biology

Nerves relay sensory or motor information in the body and are made up of nerve cells, or neurons," says Gregoire. "In Professor Claudia Fallini's lab, where I do my research, we study cellular pathologies in amyotrophic lateral sclerosis and frontotemporal dementia (ALS/FTD). We differentiate the neurons we study from induced pluripotent stem cells (iPSC), derived from patient skin or blood cells. Using immunofluorescence and our Leica DMi8 Widefield Fluorescence microscope, we visualized this stunning motor neuron. During the differentiation process, not all the stem cells differentiated into neurons, instead forming a mass of cells, visible here above the lone neuron."

# HONORABLE MENTION:

### Radiotagged Diamondback Terrapin Hatchling, Spring 2021

### Carolyn Decker, graduate student in natural resources science

"This nine-month-old, rare salt marsh turtle is about the size of a poker chip and has just emerged from the secret sandy burrow where he spent his first winter," says Decker. "For my master's thesis, I documented the movements and habitat use of this species. This individual turtle helped us better understand the differing needs of hatchling and adult terrapins. My observations helped us to make wildlife management and conservation recommendations to protect the animals at all ages. This photo shows the tiny radio transmitter that was glued to the terrapin's shell so researchers could track his movements."





# HONORABLE MENTION:

### Microplastic Particle from Narragansett Bay

### Sarah Davis, doctoral student in biological and environmental sciences

"This strangely beautiful image of a 1 mm microplastic particle was captured with an Olympus BX63 automated light microscope," says Davis, who works with Professors Coleen Suckling and Andrew Davies on a Rhode Island Sea Grant project investigating microplastic particles in Narragansett Bay. "For this project," she says, "we trawl a plankton net behind a URI vessel. The net collects material floating on and just below the water's surface; the material collected is processed and analyzed in the lab. By studying the concentration and characteristics of microplastics in our local environment, we can help inform decisions about mitigating pollution at the source."



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